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the branch stations established in several States, the total number of stations in the United States is 56. Of these, 52 received the appropriation provided for in the act of Congress above mentioned.

The total income of the stations during 1899 was \$1,143,334.93, of which \$720,000 was received from the National Government, the remainder, \$423,334.93, coming from the following sources: State governments, \$240,300.20; individuals and communities, \$12,100; fees for analyses of fertilizers, \$75,294.42; sales of farm products, \$69,312.60; miscellaneous, \$26,327.71. In addition to this the Office of Experiment Stations had an appropriation of \$40,000 for the past fiscal year, including \$10,000 for the Alaskan investigation. The value of additions to equipment of the stations in 1899 is estimated as follows: Buildings, \$27,218.64; libraries, \$10,796.15; apparatus, \$16,917.07; farm implements, \$10,784.88; live stock, \$16,265.95; miscellaneous, \$22,521.93; total, \$104,504.62.

The stations employ 678 persons in the work of administration and inquiry. The number of officers engaged in the different lines of work is as follows: Directors, 71; chemists, 148; agriculturists, 68; experts animal husbandry, 9; horticulturists, 77; farm foremen, 21; dairymen, 23; botanists, 52; entomologists, 48; veterinarians, 36; meteorologists, 17; biologists, 7; physicists, 7; geologists, 5; mycologists and bacteriologists, 20; irrigation engineers, 5; in charge of substations, 16; secretaries and treasurers, 24; librarians, 9; and clerks, 43. There are also 48 persons classified under the head of 'miscellaneous,' including superintendents of gardens, grounds, and buildings, apiarists, herdsmen, etc. Three hundred and eight station officers do more or less teaching in the colleges with which the stations are connected.

During 1899 the stations published 445 annual reports and bulletins. Besides reg-

ular reports and bulletins, a number of stations issued press bulletins, which were widely reproduced in the agricultural and county papers. The mailing lists of the stations now aggregate 500,000 names. Correspondence with farmers steadily increases and calls upon station officers for public addresses at institutes and other meetings of farmers are more numerous each year. The station officers continue to contribute many articles on special topics to agricultural and scientific journals. A number of books on agricultural subjects, written by station officers, have been published during the past year.

SCIENTIFIC BOOKS.

The Diuturnal Theory of the Earth. Published by MYRA ANDREWS and ERNEST G. STEVENS. New York. 1899.

This work belongs to a class usually not worth reviewing, but concerning which it is perhaps unwise to be absolutely silent. In this instance the earnest, well-meaning seriousness of the author, the abounding faith of the publishers, growing probably out of close family relationship, together with the absence of absolute impossibility or absurdity in the general doctrine advocated, fully justify a brief notice of the book. It is a well-printed octavo volume of about 550 pages, and includes a portrait and a biographical sketch of the author.

Mr. William Andrews, the discoverer of the 'diuturnal motion of the earth,' was born in Philadelphia in 1798, and died at Cumberland, Md., where he had lived for half a century, on August 6, 1887. The preface to his book is dated 1876—and it was issued late in the year 1899. His business was that of a stationer and book binder, but his chief delight was in making geological and natural history collections, accumulating a 'museum' containing many thousand specimens. In this work he appears to have been successful and a portion of his 'museum' was purchased by the State of New York. The preparation of this work occupied much of his time during the later years of his life, but he also left manuscript essays on psychology and

philosophy, the publication of which in the near future is promised.

That he was a great genius does not seem to be doubted by his biographer, Mr. E. S. Stevens, who declares that he was not only a great geologist, but also a great philosopher; that he was "the greatest scientist America has produced," that "he has left little to be accomplished," and that he has "taken his place beside Copernicus, Galileo, Newton and Darwin."

And what is the 'diuturnal motion of the earth' upon the conception and alleged proof of which so much claim to distinction is made to rest? No very clear account of it is to be found anywhere in the book, but it is obviously intended to mean a slow, progressive movement of the pole of the earth's axis of revolution in a spiral line around the earth's surface. Maps are given showing six lines of polar transmission across the Eastern and the Western hemispheres, and the period occupied in passing through one 'curl' of the spiral is assumed to be extremely great. This movement of the position of the earth's axis would necessarily produce great climatic changes, but in addition to this it is alleged that there would be a shifting of the superficial strata or crust of the earth relative to the interior, and upon this hypothesis is founded an explanation of existing geological phenomena, which, in the judgment of the biographer, 'transforms the patchwork of geology into a complete science.'

Among numerous illustrations of the author's fitness for discussing problems involving physical and dynamical laws, in which the book abounds, the following may be quoted: "Heat we claim to be material; it is substance and gravitates towards the center of the earth, constantly keeping an equilibrium between the interior forces and the external atmosphere, with its stratified fields of electricity and magnetism; but when that gravitated heat comes in contact with sedimentary deposits, containing a superabundance of compound substances, as vapors, gases and ethers, and liberates these through the action of the chemical processes in that great laboratory of nature, they must find their outlet through established chimneys, as volcanoes, or otherwise make new openings for their ascent to the upper air; and only in

events like this would we be willing to attribute the phenomena called earthquakes to internal forces."

Speaking of Galileo the author says, "He discovered that the vibrations of all pendulums, even of different lengths were performed in equal time. * * * He also ascertained the beating of the pulse from this fact and counted it by the vibrations of a pendulum. * * * He discovered the thermometer, an instrument by which is measured the expansion or condensive heat of the atmosphere."

The author shows considerable familiarity with the literature of science, from which extensive quotations are made, often having little relation to the subject under discussion.

There is left with the reader a feeling of regret that those who have the means to contribute to the advancement of science by the issue of such expensive publications as this should not have sought competent advice from recognized scientific authority before going to the printer and book binder.

T. C. M.

Elements of the Differential Calculus. By JAMES McMAHON, A.M., Professor of Mathematics in Cornell University, and VIRGIL SNYDER, Ph.D., Instructor in Mathematics in Cornell University. New York, Cincinnati, Chicago. The American Book Company. 1898. Pp. xiv + 337.

We have examined this book with pleasure. It was evidently composed in the light. Pedagogical and scientific qualities are united in a degree seldom attained in elementary textbooks. Sound argument, genuine demonstration, logical concatenation, are seen to be, in general, more consistent, than is commonly supposed, with required simplicity and clearness. The claims of the logician, on the one hand, and of the didactician, on the other, are adjusted with notable good judgment and skill. Illustrative solutions are numerous and the volume contains a plenty of suitable exercises for the reader, but the book is by no means a mere 'quarry of examples.' Even less, if possible, is it intended to be a guide to the mere practician. On the contrary, the treatment aims first of all at being scientific. The modern